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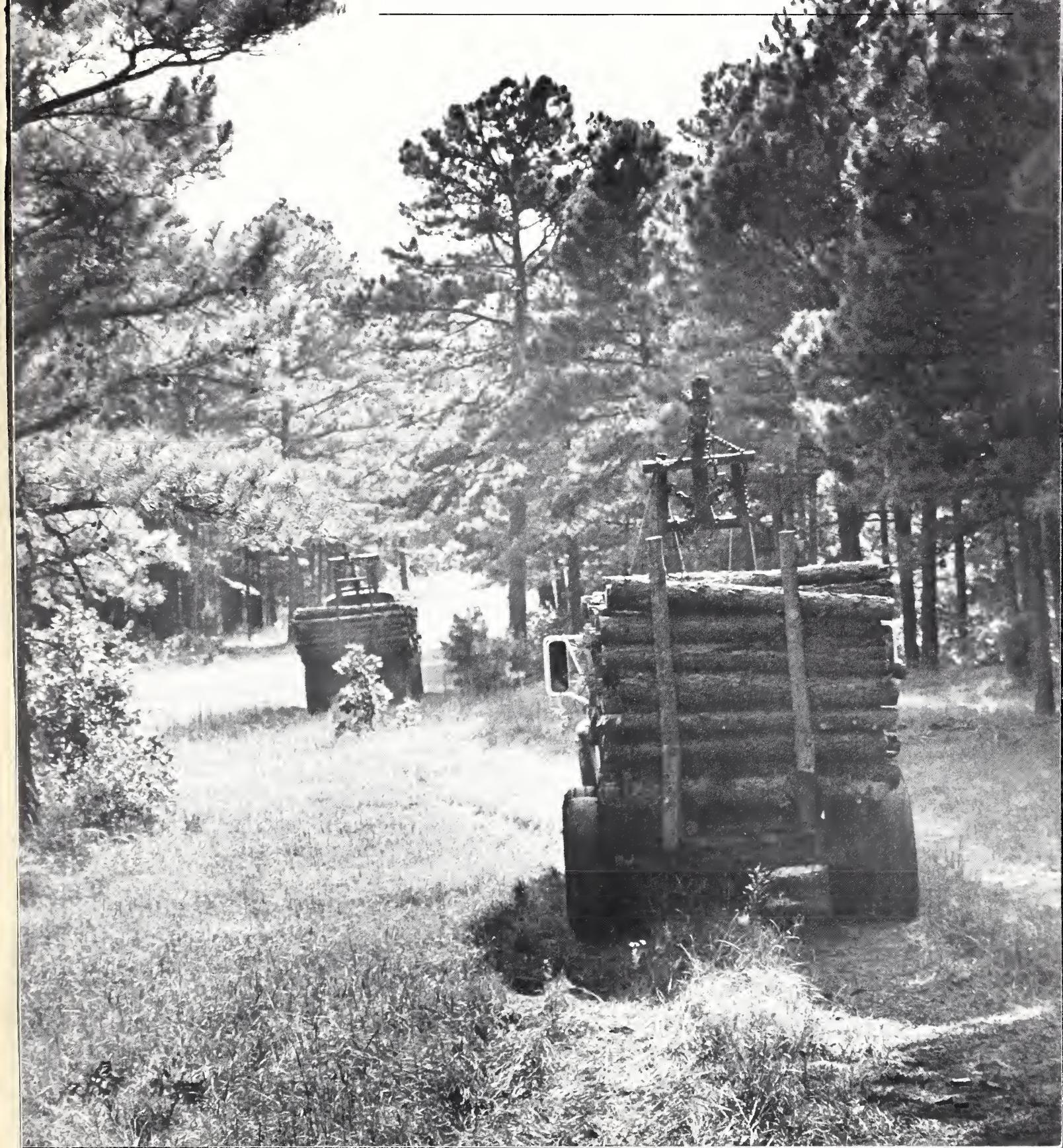
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Soil Conservation Service



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Comments: From the SCS Chief

Trees Protect Soil and Water

Controlling erosion on the Nation's non-Federal forest land is gaining fresh emphasis in the U.S. Department of Agriculture. The Soil Conservation Service and local conservation districts will be concentrating efforts on the 17 million acres of private forest land now eroding at rates that exceed tolerable limits. Our conservation planning assistance will be aimed at solving sheet, rill, and gully erosion as well as erosion damage along logging roads, skid trails, and streambanks.

SCS is concerned about erosion control on all lands. On private forest land, we share the erosion-control responsibility with USDA's Forest Service and State forestry agencies as well as conservation districts. We coordinate our forestry activities with these agencies, and we will continue to build on this cooperation.

In addition to leading the Department's erosion control efforts on private forest land, SCS also has a leadership role for windbreak forestry. We are continuing to emphasize the establishment of field windbreaks to control cropland erosion, especially in the Great Plains States.

Windbreaks not only protect cropland from wind erosion but also save energy and provide wildlife habitat. I know that the several miles of windbreaks on my farm in southeast Missouri have done much to control wind erosion and enhance wildlife.

An estimated 2,500 miles of windbreaks are planted with SCS assistance annually. Through its plant materials program, SCS has released 18 species of trees now commercially available for use in windbreaks.

Good tree cover is good soil conservation. It is often an excellent use for marginal cropland from which farmers usually get low returns and high soil erosion rates.

The Nation's nearly 400 million acres of non-Federal forest land provide wood, water, wildlife habitat, grazing, recreation, and other benefits. It can be managed for a single use or for a combination of uses. The soil, climate, topography, and plant cover determine how productive forest land can be. Good management can reduce soil erosion, protect water quality, and assure that forest land meets more of its varied potential.



Cover: Thinning operations in pine forests like this one in Latimer County, Okla., allow producers to harvest pulpwood and posts for income while improving their stand of timber. Thinning of less desirable trees allows more room for growth of the better trees, which leads to higher quality timber, improved wildlife habitat, and better ground cover for erosion control. See articles beginning on page 3. (Photo, F. Dwain Phillips, public affairs specialist, SCS, Stillwater, Okla.)

John R. Block
Secretary of Agriculture

Peter C. Myers, Chief
Soil Conservation Service

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Improving Forest Land Management



Photo, Paul C. Hixson, courtesy of *Illinois Research*,
University of Illinois at Urbana-Champaign.

Information Campaign Organized in Southeastern Oklahoma

More than 50 percent of the forest land acres in the United States are privately owned, and forest industries will look to private landowners for a big part of the future wood products.

Oklahoma has 8.6 million acres of forest land with 2.8 million acres owned by small private owners and farmers. In 1981, a forest land management information campaign was organized in southeastern Oklahoma to promote timber stand improvement, tree planting, and erosion control on private forest lands.

The major goal of the campaign is to provide information about available assistance from State and Federal agencies and to inform landowners of management techniques that can help them develop their forest land. Most of these private forest lands are unmanaged and are producing far below their capabilities.

The campaign committee consists of representatives from the Oklahoma Conservation Commission, nine conservation districts, the Oklahoma Forestry Division, the Soil Conservation Service, the Cooperative Extension Service, the Agricultural Stabilization and Conservation Service, and the Ouachita Mountains Resource Conservation and Development (RC&D) Council.

The conservation districts are: Valliant, Haskell County, Kaimichi, Latimer County, Le Flore County, Little River, Pittsburg County, Talihina, and Pushmataha County.

The campaign committee has used the usual outlets—television, newspapers, and magazines—and one unusual outlet. Nine telephone companies have published color photographs of forest lands on the covers of their directories and more are expected to do so. Conservation districts have developed portable displays and held tours and information meetings. Information packets were mailed to more than 400 absentee landowners with a letter from the local conservation district

telling them of available technical and financial help.

The campaign has shown results in increased tree planting and timber stand improvement and increased requests for assistance. One SCS district conservationist says four of five recent plantings of about 100 acres each were by absentee landowners. People who have seen or heard some of the campaign's publicity are visiting conservation district offices for more information. Since the campaign began, both tree planting and timber stand improvement on private nonindustrial forests increased by an estimated overall average of 13 percent in southeastern Oklahoma.

Roger Tate,
RC&D coordinator, Ouachita Mountains RC&D area,
SCS, Wilburton, Okla.

The Texas Approach to Saving Soil and Managing Timber

Two northeast Texas counties switched from cotton gins to paper mills and reduced their average annual soil loss from 30 tons to 300 pounds per acre. Marion and Cass Counties once supported nearly 60 cotton gins. But with low cotton prices, a shortage of labor, and severe erosion, cotton production declined during the forties. Most of the counties' cropland was left idle, the sandy soil exposed and subject to severe erosion from water runoff.

During the fifties, the USDA's Agricultural Stabilization and Conservation Service (ASCS) Soil Bank program paid landowners to plant trees and other cover crops. Trees serve as a year-round umbrella to protect soil from the driving force of rain. Landowners, encouraged by the Marion-Cass Soil and Water Conservation District's (SWCD) massive pine tree planting promotion, planted 11 million pine seedlings in 1957. Since then they have been averaging 1.4 million seedlings planted per year, on an average 2,000 acres per year.

ASCS' Agricultural Conservation Program picked up where the Soil Bank left

off, and 2 years ago, the timber industry began paying landowners to plant pine trees in Texas. The result is that two counties that were once 80 percent cropland are now 0.5 percent cropland, 67.5 percent forest land, and 32 percent pastureland.

Today, pine timber is the counties' major cash crop. There are pine trees 50 to 60 feet tall growing in still visible plow rows and along terraces, reminding landowners of the past.

Due to these tree planting efforts, several timber companies began building mills in the counties. This increased competition among timber buyers brings the landowners higher prices for their trees.

Beginning in 1956, the Marion-Cass SWCD cosponsored a forestry short course along with USDA's Extension Service, ASCS, and Soil Conservation Service; the Texas Forest Service; forestry consultants; and timber industry representatives. The short course is taught twice a year, each time reaching about 80 landowners, mostly absentee landowners.

The landowners hear experts discuss forest management ideas which can be used on their forest land. They also take a field trip to see management practices being applied to the land, including planting trees, improving timber stands, burning by prescribed methods, and improving wildlife habitats.

In 1957, the SWCD began a forestry clinic for 4-H and Future Farmers of America clubs. A four-member team from each of the six schools in the SWCD's counties is trained in forestry skills by vocational agriculture teachers and club sponsors. In an annual competition, the six teams use their forestry skills at 12 outdoor stations to perform such activities as identifying tree species, determining tree-soil suitability, and estimating the volume of timber.

Although the Marion-Cass SWCD began the clinic, the idea has spread to several other SWCD's and has even spawned a State-level competition. Next year the forestry clinic will become a regional contest to include Arkansas, Louisiana, Oklahoma, and Texas.

The Marion-Cass SWCD has witnessed a dramatic change in land use over its 40-year history, accompanied by an equally dramatic reduction in soil loss. The landowners have pulled together to help solve the problem of severe erosion on their land.

Charles W. Snowden, Jr.,
district conservationist, SCS, Linden, Tex

Alabama Conservation District Promotes Tree Planting

The Coffee County Soil and Water Conservation District (SWCD) in southern Alabama has been a leader in promoting forestry in Coffee County and throughout the State.

In 1979, the SWCD was the first in Alabama to organize a county forestry advisory committee, to promote tree planting in support of a resolution passed by the National Association of Conservation Districts (NACD). The NACD resolution stated that the NACD would support a tree planting program in the South. District Supervisor Martin Moates helped organize the forestry advisory committee and was instrumental in getting the committee off to a good start. When the committee was organized, Moates emphasized the need to get more trees planted, especially on marginal cropland.

In the first year after the program started, the county gained about 1,000 acres of pine trees. To promote tree planting, the committee distributed 500 "Plant Trees" bumper stickers, put a similar message on a billboard by a busy highway, and distributed forestry information packets to 50 forest landowners. They also have promotions on television and radio.

The committee works with local Future Farmers of America chapters and involves students in tree planting projects. Forestry tours are held for landowners to help them have a better understanding of forestry and the need for different forest management practices such as prescribed burning and tree planting. Recent

activities of the forestry advisory committee include the formation of a prescribed burning subcommittee to help coordinate prescribed burning efforts and increase the acreage of prescribed burning being done on private forest lands. The committee also sponsors forestry marketing seminars and workshops on timber contracts.

The Coffee County Forestry Advisory Committee and forestry advisory committees in other counties have been so successful that Alabama now has a forestry committee in every county.

The Alabama Forest Regeneration Committee, which is sponsored by the Alabama Association of Soil and Water Conservation Districts, has printed 10,000 "Plant Trees" bumper stickers for distribution statewide. Alabama travelers can now see cars or trucks with this sticker almost everywhere in the State.

In 1981, the Alabama Forest Regeneration Committee presented the Coffee County Forestry Advisory Committee with a certificate of appreciation for their outstanding efforts in promoting tree planting.

The Coffee County SWCD has played an active role in getting something done about reforestation and forest management. They saw a need to promote and manage a valuable natural resource and they did something about it.

Jerry L. Johnson,
State staff forester, SCS, Auburn, Ala.

Free Trees Planted on Marginal Cropland

About 10,000 acres of marginal cropland were planted to trees in Alabama during an intensive effort in February 1983. This change in land use has taken land that had severe erosion problems and low returns out of row crop production. The Alabama Forestry Commission donated more than 8 million pine seedlings for the project. County forestry committees learned of the opportunity about February 1 and immediately organized local forces to contact farmers with marginal cropland. They used many means including mass media to inform farmers of the program and helped locate planting equipment and vendors. Local soil and water conservation districts encouraged co-operators to consider the project. The Soil Conservation Service reviewed the applications for the trees and certified that the land was marginal cropland.

The USDA's Forest Service and SCS helped the Alabama Forestry Commission identify the opportunity. Guidelines were made by the Alabama Forestry Planning Committee, an organization of agencies interested in forestry, the Farm Bureau, and forest industry representatives.

The MacMillan Bloedel Paper Company gave about 1 million trees to farmers also for planting on marginal lands.

"The program was successful because the agency and forest industry people worked together and because farmers are looking for more efficient ways to farm and reduce soil erosion," said Ernest V. Todd, SCS State conservationist. Todd says about a half million more acres of marginal land in Alabama need to be planted to trees or permanent grass.

SCS is helping farmers find cost effective ways to control erosion and, in some cases, converting marginal cropland to forest land is the best solution. Farmers usually get low returns and high rates of soil erosion when farming marginal cropland.

Morris S. Gillespie,
public affairs specialist, SCS, Auburn, Ala.

Washington State Tests Cut-Your-Own Firewood Program

Spokane County, Wash., residents are paying for the privilege of thinning out pine thickets for forest landowners. What they are getting in return is plenty of good firewood.

The Spokane County Conservation District (CD) began a combination firewood sale and timber stand thinning program on private land last year in reaction to a shortage of reasonably priced firewood. The Spokane County CD was afraid that uncontrolled cutting would damage private forests.

They also saw the firewood shortage as an opportunity to do a needed thinning on the county's share of the 600,000 acres of stagnated lodgepole and ponderosa pine thickets that invaded parts of Spokane, Pend Oreille, and Stevens Counties after a series of forest fires in the first decade of this century. The costs and labor involved in thinning these timber stands had discouraged landowners from doing the job themselves.

But offers of firewood at under \$10 a cord was all the incentive many Spokane County residents needed. Extensive media coverage alerted the public and 200 people signed contracts with the conservation district, agreeing to pay \$100 for a 90-day permit to cut firewood on plots that range from 1 to 2 acres. The contract guarantees the woodcutters at least 10 cords of firewood, but most are able to cut more than 20 cords. The Spokane County CD requires the woodcutters to burn all debris left by their cutting, subject to the restrictions of a burning permit.

Private foresters, also under contract with the Spokane County CD, use ribbon to mark the property involved and divide the land into plots. They paint marks on trees that are not to be cut, alternating colors in adjacent lots in a checkerboard pattern, to avoid boundary mistakes. The foresters also supervise the woodcutters.

The foresters collect the fees for the conservation district and receive all of the money left after the owners are paid \$25

per plot and the district is reimbursed for paint, ribbon, and other supplies. To make the program financially feasible, the district signs contracts only with people who own at least 25 acres of forest land.

Contracts have been signed for more than 500 acres of forest land, including tracts that are scheduled for suburban development. The trees remaining on the plots that have been thinned are healthy and growing rapidly for the first time in years. On the suburban tracts, the woodcutters do a better job of tree removal than bulldozers, and they do not leave the debris that may harbor beetles and cause infestations of the trees that are left standing.

The program has been so successful that the Spokane County CD and USDA's Forest Service are receiving inquiries from other Washington counties and also from counties in Oregon, California, and Idaho. In Washington State, the Pend Oreille County CD has started a similar program and Lewis, Pierce, and Thurston Counties are planning to try the idea.

In Spokane County, USDA's Forest Service and Agricultural Stabilization and Conservation Service, the State Cooperative Extension Service, and the State Department of Natural Resources all refer landowners to the conservation district's office for information about the program. The Soil Conservation Service Spokane field office staff works with the district on the program.

Tim King,
soil conservationist, SCS, Spokane, Wash.

Timber Improvement Increases Profits, Saves Soil

A team of Minnesota State foresters is showing farmers how proper management of their hardwood trees can bring them much higher prices for their timber.

In 1979, a commission of the Minnesota legislature authorized and funded the Private Forest Management (PFM) program to improve the productivity of small private woodlots and improve water quality by controlling erosion and sediment.

Farmers in southeastern Minnesota's "river counties" are blessed with rich soil and reliable rainfall. However, the land along the Mississippi River is also bisected by many valleys formed by the river's tributaries. The valley walls are steep and their protection from erosion is essential to keep the valley lands from flooding and the ridge lands from gulling.

Trees are the only crops that can be grown on the steep valley walls that will protect the soil and still provide a good economic return. But there's more than one way to grow trees.

The hardwood forests along the valley are generally of poor quality, cut over, second- or third-growth timber characteristic of unmanaged woodlots. The timber is commonly logged for low-value products such as pulp or firewood, so the economic return is not very good. Often these lands are grazed to the detriment of both the trees and the soil.

The Division of Forestry of the Minnesota Department of Natural Resources was assigned responsibility for technical assistance under the PFM program, and received funds to hire a staff of four foresters and one secretary to work with landowners in southeastern Minnesota. The eight soil and water conservation districts (SWCD's) in the project area were enlisted to operate a cost-share component of the program. These conservation districts are: Wabasha, Goodhue, Dodge, Olmsted, Winona, Burns-Homer-Pleasant, Fillmore, and Root River.

The Soil Conservation Service worked

jointly with the State foresters, through the SWCD's, to help landowners manage their woodlots properly.

Funds were allocated to the SWCD's through the Soil and Water Conservation Board of the Minnesota Department of Agriculture. The SWCD's were responsible for taking and screening applications, setting aside funds, and approving payments. PFM cost-share funds could be matched with USDA Agricultural Stabilization and Conservation Service cost-share funds.

Four practices allowed under the PFM program were tree planting for timber production, including high value species such as walnut and oak; timber stand improvement; woodlot fencing; and logging-road construction.

During its 2-year lifespan, the PFM program provided funds for installing 70,000 linear feet of roads, 1,518 rods of fencing, 2,073 acres of timber stand improvement, and 756 acres of forest tree plantations. Nearly 500 applications for assistance were approved and serviced.

One of PFM's most important benefits for the participating SWCD's was the cooperation with the State foresters who brought them into direct contact with forestry as a tool to produce an economically important crop. The State forestry staff worked so well with the SWCD's that their positions were retained when the funds for the program ended.

Dave Peterson,
board representative, Minnesota Soil and Water Conservation District Board, Rochester, Minn.

Container-Grown Seedlings Yield Hardy Trees

Greenhouse-grown pine seedlings provide a winter "crop" for a Minnesota conservation district and a source of healthy trees for windbreak and reforestation projects. The Cass Soil and Water Conservation District (SWCD) in north-central Minnesota, in cooperation with the Cass and Beltrami Counties Land Departments, planted their 1983 "garden" of trees in a greenhouse in January. Sixteen weeks later, the containerized trees were ready for sale to area residents.

"Trees produced in the near perfect greenhouse environment have many advantages over those grown in conventional outdoor nursery beds," said Dennis Hummitzsch, Cass County forester in charge of the program. "Maintaining temperature, moisture, and fertilization at optimum levels dramatically increases growth rates, with some species reaching heights of 14 inches within 16 weeks of seeding. Disease or insect problems can be easily isolated and controlled with pesticides added through the irrigation system. Trees are planted with their root systems completely intact, so virtually no transplanting shock is experienced," explained Hummitzsch.

Unlike bare-root nursery seedlings that must be planted before they break dormancy, containerized seedlings can be planted whenever soil and climate conditions are best. "Trees are hardier and begin growing immediately," added Hummitzsch.

Production of the seedlings starts with Styrofoam "planting blocks" containing 240, 1-inch-diameter holes filled with a growth medium. Seeds planted in these holes germinate quickly and grow rapidly under the ideal conditions. Nutrient levels are adjusted initially to encourage top growth, and later to develop a stable "root plug." After 14 to 18 weeks in the greenhouse, the seedlings are moved outside to "harden off" or become acclimated before planting.

Containerized seedlings lend themselves very well to either machine or hand planting. Planting blocks can be carried

on the tree planter, eliminating the need for sorting or the careful storage and handling procedures necessary for bare root stock. Using a special hollow planting bar, a worker can hand-plant up to 3,000 containerized trees in a day without bending over, compared to 1,000 by conventional methods.

According to Willard Pehling, Soil Conservation Service soil conservation technician, Walker, Minn., the impacts of planting containerized trees for conservation purposes could be tremendous.

"Windbreak, critical, or reforestation areas need not be planted in early spring if conditions are not acceptable, dramatically increasing survival rates. We've had survival rates of 84 to 96 percent in field tests," said Pehling.

"Trees can be kept in their planting blocks indefinitely. This is an extremely

important factor in a windbreak, where the landowner expects every tree to grow," Pehling explained. "The rigid controls on growth guarantee size, uniformity, and condition of seedlings. With the greenhouse capable of producing multiple crops, it is conceivable that a conservation district could plant trees throughout the growing season.

"Genetically superior seedlings are being planted in a 'seed orchard,' so that future tree crops can be bred for desired characteristics," Pehling added.

For more information on this project, contact the Cass SWCD, Box 89, Walker, Minn. 56484.

John M. Sumption,
district coordinator, Cass Soil and Water Conservation District, Walker, Minn.



Minnesota Soil and Water Conservation District Board Representative Hal Anderson holds an 18-week-old, 10-inch jack pine seedling ready for field planting. Other seedlings, in their Styrofoam blocks, stand ready for planting.

New Hampshire Wants Trees as Well as State to Grow

Snowmobile owners, birdwatchers, and the timber industry are enthusiastically working together to support the "Year of the Forest" in New Hampshire.

The New Hampshire Forestry Communications Council, an organization that supports broad-based efforts to improve education and communication among groups with diverse interests in forests, declared 1983 the "Year of the Forest." Besides special-interest groups, the Council has representatives from State and Federal government agencies, including the Cooperative Extension Service and USDA's Forest Service and Soil Conservation Service.

The Council's activities are funded with members' dues and the Council has raised additional money by selling almost 2,000 "Year of the Forest" bumper stickers at \$1 each. Its speakers bureau has provided speakers for the annual meetings of some conservation districts. The Council prepared an Arbor Day booklet on tree planting activities and gave copies to every elementary school in the State. The booklets were so well received, many teachers asked for more.

The Council has also prepared a slide show on tree farms in the State. The American Forest Institute has certified more than 800,000 acres of woodlots in New Hampshire as tree farms. The Institute awards tree farm certificates and signs to owners who properly manage more than 10 acres of woodlots for multiple uses. There are 48,000 certified tree farmers nationwide, with tree farms in all 50 States.

Other plans for the Year of the Forest include exhibits, a calendar of forestry events in the State, a toll-free telephone number for forestry messages, poster contests and science projects in schools, and forestry field days for farmers.

The Council plans to demonstrate new tree shredding machines, adapted to the local terrain, that offer farmers a chance to earn cash for poor quality trees removed to make space for higher-value

trees. The shredders convert the trees to wood chips that can be sold to industry as fuel for boilers.

New Hampshire's public television began the year by twice showing "Yankee Woodlot," a Maine Public Broadcasting series on woodlot management. Viewers could buy an accompanying workbook, too.

There are 4.7 million acres of woodland in New Hampshire, covering more than 80 percent of the State. The problem is that as the population increases, especially in the southern part of the State which is in the shadow of the Boston metropolitan area, the woodlands are being divided into smaller parcels. This means more owners to convince that the woodlots should be managed properly.

Lester DeCoster, vice-president of forest resources for the American Forest Institute, says New Hampshire's Year of the Forest program is a good example of various groups getting together and agreeing on a single theme: "Keep the Living Forest in a Growing State."

For further information, contact the New Hampshire Forestry Communications Council, 54 Portsmouth Street, Concord, N.H. 03301.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*,
SCS, Washington, D.C.

TVA Offers Forestry Package

A package of microcomputer programs for forest management, developed by the Tennessee Valley Authority, is gaining widespread acceptance in forestry circles.

The key to the Woodland Planning and Analysis software, called WOODPLAN, is its versatility. Foresters are using the programs to quickly analyze yields based on harvest schedules and management practices, to make timber inventories, to handle bookkeeping and accounting problems, and to deal with other financial and management needs.

These computer programs are designed especially to make the results of forest research available to small woodland

owners in a practical way. To date, WOODPLAN components have been applied to forest properties of some 2,000 private landowners involving more than 1 million acres.

About 75 organizations—including consulting firms, forest industry, universities, State forestry departments, and USDA's Forest Service—are using WOODPLAN with a projected coverage of some 15 million acres within 5 years.

For information on the program, contact Larry Hamner, Tennessee Valley Authority, Forestry Building, Norris, Tenn. 37828.

University Studies Mix of Forestry and Farming

Researchers at the University of Illinois (U of I) are studying the most effective ways to combine forestry and farming. According to Clarence J. Kaiser, associate professor of agronomy at the U of I Dixon Springs Agricultural Center, the goal of the U of I study is to find the best management techniques to make "agroforestry" work.

They are considering such topics as what the best pesticides are for agroforestry; what grain crops and forages could be grown without being disturbed by the shading from trees; what the possibilities are for meeting energy needs by using the biomass production from nitrogen-fixing trees such as the autumn olive, black alder, and black locust; and what the nut and wood yields are of black walnut integrated at various densities with various crops and with livestock grazing.

Agroforestry is not a new idea, Kaiser notes. In the United States, pine plantations and orchards sometimes have doubled as grazing land for livestock.

On the other hand, he says, mixing cash-grain crops with a forestry operation has been rare. Typically, forestry and grain crops have been at odds. Either the land has been strictly used for a cash-grain crop or for forestry purposes; and most often in Illinois, the choice has gone in favor of the cash-grain crop.

Agroforestry can be practiced in two

distinct ways, says Lester Arnold, U of I forester. In the first approach, forestry production is simply considered a supplementary part of the enterprise. The farmer may use the trees only for wind-breaks, erosion control, wildlife habitat, or biofuel.

In the second approach, the forest products—Christmas trees, nuts, or high quality lumber or veneer, for example—are considered just as important as the crops or livestock being produced.

But the major question is whether it will ever be economically viable to mix forestry and farming. According to Arnold, the answer is "possibly."

With the growing scarcity and expense of fossil fuels, he says the potential for using woody biomass as an on-the-farm energy source may someday give agroforestry an economic edge over some conventional forms of farming.

In fact, Arnold says that agroforestry may have a particular advantage on highly erodible, upland soils because trees give the soil good protection from the erosive impact of raindrops and runoff water. Therefore, this system may be the answer to a farmer's erosion woes on marginal land.

Farmers and foresters have similar problems and similar aims, Kaiser says, but the expectations are different. He notes that farmers expect a quick return of 3 to 36 months on their relatively large investment, while foresters invest modestly and expect a return only after 5 to 50 years.

However, Kaiser says that the differences between the two operations could serve to a farmer's benefit when they are combined into one system. If an agroforestry operation is managed properly, a farmer may be able to draw on the advantages of each system and come out ahead in the long run.

In the coming years, Kaiser says the U of I Experiment Station intends to shed some light on what that "proper management" requires.



Photo, Paul C. Hixson, courtesy of Illinois Research, University of Illinois at Urbana-Champaign.

No-Till-Plus: A Technique for Profitable Conservation Farming

Acreage of crops grown under no-till methods is increasing in the South. Two types of no-till are used and acreages in both types are increasing. They are: standard no-till and no-till-plus, and it is the no-till-plus acreage that is expanding most rapidly.

Standard no-till is suitable for soils in good physical condition. Farmers skilled in no-till farming can usually obtain good to excellent results using standard no-till implements—but only in uncompacted soils. Most fields that have been mechanically farmed over a period of years have become so compacted in the plowed zone (Ap horizon) that farmers often cannot get profitable production with standard no-till. In soils that are compacted, standard no-till does not provide for the capture of sufficient moisture and does not allow the root development needed for good growth.

No-till-plus is a technique that combines under-the-row subsoiling with standard no-tillage. It is suited for fields where the surface soil is compacted, but where the subsoil is in good physical condition. No-till-plus offers the conservation advantages of standard no-till with increased production.

Few farmers can afford conservation with the low production of standard no-till in compacted soil. After the problem was recognized and it was realized that the compact zones could be bypassed, determined southern farmers and manufacturers developed special equipment to pierce the compacted layer under the row to be planted. It is the pierced channel through the Ap horizon that makes much of the soil profile permeable to air, water, and roots. Because the channel is hidden from later interrow traffic, there is no opportunity for its recompaction.

A large percentage of the new no-tilled acres in Virginia, North and South Carolina, Georgia, Florida, Alabama, and Mississippi are no-till-plus farmed, according to a spokesman for one no-till-plus equipment manufacturer. Several

manufacturers offer a choice of implements with design variation.

Higher yields can be produced with no-till-plus than with conventional tillage under soil conditions where standard no-till can fail to produce crops equal to conventional tillage. And surprisingly, some farmers using no-till-plus in unirrigated soils previously considered marginal are producing yields that are very acceptable. No-till-plus does not guarantee outstanding yields, but the technique has consistently outyielded conventionally tilled fields in the Coastal Plains of the Southeast—and has reduced erosion noticeably.

The cost of more power and fuel required for no-till-plus over standard no-till dictates that farmers consider their soil condition before deciding which no-till method to use. More research is needed to enhance both methods.

As no-till-plus works in the Southeast where a near massive Ap horizon makes fields poorly permeable to air, water, and roots, so should the principle apply throughout the United States. Fields that have been conventionally farmed over a period of years often form a compact Ap horizon—a condition poorly suited to standard no-till. As no-till-plus is introduced into new areas, proponents predict a nationwide increase in no-till acreage due to no-till-plus farming.

Albert C. Trouse, Jr.,
former soil scientist, USDA National Tillage
Machinery Laboratory, Auburn, Ala., now retired.

Morris S. Gillespie,
public affairs specialist, SCS, Auburn, Ala

USDA, Cornell Get to the Root of Crop Productivity

The U.S. Department of Agriculture and Cornell University of New York have initiated a national research program on plant and soil interactions.

The Center for Root-Soil Research will coordinate study of root-soil relationships and how they affect plant yields and crop quality. The Center's activities will be co-ordinated by USDA Soil Scientist David

L. Grunes and by David R. Bouldin, professor of agronomy in the New York State College of Agriculture and Life Sciences at Cornell.

According to Grunes and Bouldin, agricultural research has often treated the soil as a "black box." Little attention has been given to the zone of contact between plants and the soil.

The new Center, however, will concentrate on the chemical and biological processes occurring at the root-soil interface. Attention to soil management, its relationship to root growth and crop productivity, and the recycling of nutrients from manures and sewage will also be important Center priorities.

"These studies will lead to improved soil and crop management," said Grunes, who will coordinate many of the Center's projects as part of his work at the U.S. Plant, Soil, and Nutrition Laboratory in Ithaca, N.Y. "Roots are the critical link in the plant's ability to absorb water and essential ions."

Past root and soil studies were limited by an inability to "see" the molecular processes of root activity, the cooperating scientists said.

Technology has changed that. Fiber optic systems for studying rooting patterns; argon plasma vacuum spectrometers for analyzing soil extracts, plant tissues, and water; scanning spectrofluorometers for determining organic and inorganic compounds; and other equally advanced equipment and techniques are opening a new world for scientists.

The tools will aid attempts to explain the dependency of plant yield and quality on soil types and conditions, Grunes and Bouldin said. Better understanding of root growth and interactions with the soil should some day assist farmers in selecting plant varieties that can withstand local stresses like poor soil drainage, acidity, water deficits, and extreme soil temperatures.

"We also hope this national effort will improve productivity by better tailoring liming and fertilization strategies to local soil conditions," they added.

Notched Ditch Delivers Uniform Flow of Irrigation Water

A new, labor-saving ditch has been introduced into the upper Gila Valley around Safford, Ariz. Called a notched ditch, it is designed to deliver a uniform flow of water to each furrow within an irrigation set without the need for siphon tubes.

In this area, where diverted surface waters from the Gila River provide the major source of irrigation water, the river frequently carries a high silt and debris load. This causes plugging of siphon tubes and, unless the irrigator maintains a continuous surveillance, results in overtopping of ditches. Notched ditches do not seem to be affected by these debris problems.

In order to perform correctly, however, the ditch notches must be carefully installed. An engineering study by USDA's Soil Conservation Service and Agricultural Research Service personnel during the 1981 irrigation season showed that the notch bottoms must be at a uniform level. As a result, SCS specifications call for 80 percent of the notch bottoms to not vary more than 0.01 foot and the remaining 20 percent to be within 0.02 foot of the designed level. Variances greater than these affect the quantity of water discharged through the notches.

To control water flow in these ditches, checks are installed in the ditch for each irrigation set. These allow the irrigator to easily control the water level in the section being used and result in a uniform flow discharge into each furrow. Also, because the water builds up evenly in the ditch, water is delivered to the furrows at the same time.

Based on experience, SCS personnel have found that the maximum practical length of a notched ditch on a zero percent cross slope field is 800 feet. Where head ditches must be longer, the notches at the upper end of the ditch must be raised enough to keep those at the lower end high enough to discharge water. This causes ditch berm erosion. It can be slowed by placing coarse, mixed gravel below the notch, but this creates a

continuing maintenance problem. Therefore, notched head ditches work best on fields with some side slope or with benches.

Finally, in order to have sufficient concrete in which to create the notches, the concrete must be a minimum of 2 inches thick. Conventional ditches in the Safford area require only 1½ inches of concrete thickness.

Because of the extra concrete and labor required to build these ditches, they cost between \$7 and \$9 per foot in this area,

depending on current prices of concrete. This is more expensive than conventional ditches.

The contractor, who developed and installs these ditches, has patented his system and says the notch system is flexible to serve a wide variety of farming practices and conditions.

Jim Neveu,
district conservationist, SCS, Safford, Ariz.



Dr. John Reogle of the U.S. Water Conservation Laboratory, Phoenix, Ariz., examines the furrow flumes used to measure irrigation flow during the notched ditch study. Properly installed notched ditches eliminate the need for siphon tubes.



If ditch berm erosion should occur, it can be slowed by placing coarse, mixed gravel below the notch.

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Soil Conservation Service
P.O. Box 2890, Room 0213-S
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50 Years Ago... The Birth of an Agency



It was 50 years ago this month that the Soil Erosion Service (SES), predecessor to the Soil Conservation Service (SCS), was established. As was the case with a few other Federal agencies, SES was largely the creation of an individual. Hugh Hammond Bennett, for most of his career as a soil scientist in the Department of Agriculture, published his findings in government bulletins and scientific journals. Years of making soil surveys and viewing the effects of erosion prompted him to become an advocate for corrective action. In the twenties, he wrote articles for the popular magazines and made speeches for diverse audiences. Likewise, he entered the political realm, not as a candidate but as a supporter of the 1928 legislation that authorized soil erosion research stations.

The emergency employment programs of the Great Depression gave him a chance to see his soil and water conservation theories tested. Beginning in spring 1933, several State agricultural agencies sought and received Civilian Conservation Corps camps to work on erosion control. A clause in the National Industrial Recovery Act of June 16 that permitted expenditures for erosion control prompted additional requests from State and Federal agencies.

Proposals for terracing programs spurred Bennett to action. Terracing provided employment and was certainly a part of a conservation system; but to Bennett's thinking, such an emphasis neglected the value of farm practices and vegetation in soil conservation and ignored sheet erosion. Particularly distressing to a soil scientist was the scant attention given to soil characteristics in the planning.

In response to the proposals, he wrote: "If we undertake to push through major erosion-control programs on the croplands of the country without such orderly, discriminate procedures, my experience based on what I have seen in many parts

of the country leads me to the belief that such efforts will eventually do far more harm than good." In writing to Assistant Secretary of Agriculture Rexford G. Tugwell, Bennett asserted, "That there can be no sharp dividing line between the work of the agronomist and the engineer . . . should be obvious to any one."

Bennett's views and work also became known to U.S. Department of the Interior (USDI) officials. Harold L. Ickes, Secretary of the Interior, and John Collier, Commissioner of Indian Affairs, were concerned about the effects of overgrazing on the Navajo Reservation. During their search for experts on soil conservation, the Commissioner's son, Charles Collier, became acquainted with Bennett. In late June 1933, Bennett led a team of specialists to the reservation to study the problems. The Navajo Council and Commissioner Collier endorsed the study group's plan for action.

On August 25, Ickes allocated \$5 million for erosion control work. Though Bennett's selection to head the program in USDI was hardly assured, the years of speechmaking, writing, and corresponding with others interested in conservation certainly had made him a candidate. By September 12, Secretary of Agriculture Henry A. Wallace and Ickes had agreed that Bennett would move to USDI to take up the new work, and on September 19, Bennett became the first director of the Soil Erosion Service.

Douglas Helms,
historian, Public Information, SCS, Washington, D.C.